FOREST RESEARCH DIGEST

SEPTEMBER 1935

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LAKE STATES FOREST EXPERIMENT STATION*

Forest Service U. S. Dept. Agr.

THE CHIPPEWA BRANCH

A list and very brief description of the seven branch stations of the Lake States Forest Experiment Station were given in the January 1935 issue of the "Forest Research Digest". It is now the intention to give a fuller description of the work carried out at each of these branches. In this issue the Chippewa Branch will be discussed and the other stations will be taken up in later issues.

The Chippewa Branch is located at Cass Lake, Minnesota, with a headquarters building at the Cass Lake Nursery. Most of the experimental work conducted from this branch is located on two experimental forests, the Pike Bay and the Cutfoot, although a few sets of plots are located on the Chippewa National Forest proper.

Much work has been done on the conversion of the aspen type which is so prevalent in this region. A very complete series of seed spotting experiments indicates what can be expected along this line. Planting has been tried out in many ways and in a number of the variations in the aspen type. The effect of elimination of the overstory and reduction of brush and weed competition in varying degrees is demonstrated on two forty acre blocks which have been fenced in order to prevent rabbit injury. Another plot demonstrates girdling as an effective method of removing the aspen overstory without encouraging an abundant growth of suckers.

A set of three plots is designed to show the effects of a number of factors upon the possibility of successful conversion. The benefits of removing the overstory, of fencing

* Maintained in cooperation with the University of Minnesota at University Farm, St. Paul, Minnesota.

against rabbits, of cutting the undergrowth, and finally of eliminating root competition by trenching, are demonstrated separately and in combination.

Management of the pine type, including both Norway and jack pine and its various mixtures, has also been studied extensively at this Branch. Methods of cutting mature jack pine stands to secure adequate natural reproduction have been tried out. Usually these experiments involve a number of methods of slash disposal. Plots demonstrating methods of thinning in young Norway and jack pine stands have been established on the Cutfoot Experimental Forest and elsewhere on the Chippewa. Another series of plots in a virgin Norway pine stand was designed to encourage the growth of advance white pine reproduction. Several degrees of cutting were tried out and the plots are now ready for a second treatment. A new series of pine cutting plots are being established this fall on the Cutfoot. These plots are in the nature of a demonstration of what appears to be the most beneficial type of cutting in the sub-types found in a mixed jack - Norway pine stand.

Two swamp drainage experiments have also been tried out. One of these, located at Bena, was designed to show the effect of drainage on the growth in a timbered swamp. The other swamp at Cutfoot is a non-timbered one and the drainage was designed to reduce the water level sufficiently to permit planting with conifers.

An experimental nursery has been established in a small clearing in an aspen stand. Stock of a number of species and size classes has been raised without artificial watering except at the time of seeding and transplanting. This small nursery located right in the woods has many advantages over large scale nurseries established on old pasture and farm land.

Anyone interested in seeing these experiments and studying them in detail should drop in at the branch, and whoever is in charge will be glad to demonstrate the work. This applies to any of the branch stations.

NEW FOREST EXPERIMENT STATION

The Division of Research has established a new forest experiment station with headquarters at Ft. Collins, Colorado. The station will be maintained in cooperation with the Colorado Agricultural College. R. E. McArdle will be the Director. Appropriations have been made for studies in forest

management, soil erosion and range management. Colorado, Wyoming, and parts of western Kansas, Nebraska, and South Dakota will be the territory covered by the new station's activities.

GIRDLING FIRE CHERRY

In November 1934 a series of girdling plots was established on the Hiawatha National Forest under the direction of J. R. Neetzel. On the area treated, fire cherry (*Prunus pennsylvanica*) was overtopping a good stand of sugar maple and it was decided to remove this competition. On four of the plots the fire cherry was girdled and on one plot it was cut down with axes. Another plot was kept as a check.

When these plots were examined during the first week of June of this year, the crowns of the girdled trees failed to show any signs of injury whatever and there were no sprouts except from the felled trees. A very different picture was presented when the plots were revisited the last week in July. All of the girdled fire cherry trees were dead, and most of the other girdled trees were dead or dying. The stumps of the girdled fire cherry had sprouted prolifically, but these sprouts were already dying. The sprouts from the felled trees, however, were still thrifty.

Girdling, therefore, seems to be a more effective method of reducing competition from fire cherry than felling.

Several different tools were used in the girdling work, but no difference in the effectiveness of the treatments was noticeable and a choice of tools should therefore be made on a cost basis. The comparative costs of this work, using four different tools, were presented and discussed in the March 1935 issue of the "Forest Research Digest."

NEW HARDWOOD NURSERY

A new nursery is being built by state C.C.C. workers for the Michigan Conservation Department. The nursery is located near the town of Wolverine in Cheboygan County. The purpose of the nursery is somewhat unique in the history of public owned nurseries. A major feature will be the production of hardwood trees and shrubs suitable for game food and cover, although regular hardwood forest planting stock will also be grown.

SEEDLING EXPOSURE

In the August issue of the Forest Research Digest an account of a laboratory experiment on the results of exposing young seedlings to the air for various lengths of time was given. Recently the Southern Forest Experiment Station has completed a similar experiment only under field conditions. Their work confirms the laboratory studies by this Station.

In the study conducted by the Southern Station,* seedlings which were lifted from the seed-beds for transplanting, were exposed to the natural atmospheric conditions. Periods of exposure were varied from 0 to 30 minutes under three sets of conditions: a bright, windy forenoon; a bright, windy afternoon; and a cloudy, windy day. All the other factors--day, period of exposure and species--caused significant variations in mortality in the transplant beds at the end of two and a half months. The evidence indicates that mortality increases with exposure of three minutes or longer. None of the exposures resulted in 100 percent mortality, but it is expected that mortality will be greatly increased at the fall examination.

This experiment further emphasizes the need for holding the period during which the seedlings are exposed to a minimum.

CHIEF FORESTER VISITS REGION NINE

F. A. Silcox, Chief Forester of the U. S. Forest Service, visited the Lake States Region and inspected several of the National Forests and two of the branches of the Experiment Station. He also visited the Experiment Station headquarters and while in St. Paul, he addressed the Twin City Hoo Hoo Club. In this speech he asked for cooperation from the lumber industry in the development of a national forest policy that will recognize the social needs of the forest regions. He stressed the necessity of maintaining stable communities based on the forest industries. This goal must be achieved and the industries can do much to help.

In his conversations with the administrative and research men he emphasized the need of close, whole-hearted cooperation between the different units of the Forest Service as a means of advancing the practice of sound forestry on the national forests.

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* "Southern Forestry Notes - No. 12, July, 1935" issued by the Southern Forest Experiment Station, New Orleans, La.

SPRUCE SEEDING METHODS

The production of black spruce and white spruce planting stock in nurseries has usually been accomplished with considerable uncertainty as to success. Some years a good "catch" in the seed bed is secured; other years the sowing results in almost complete failure.

Spruce seed must not be planted too deep as its tolerance in this respect appears to be very slight. An experiment in sowing both white and black spruce seed was carried out by Paul L. Zehngraff at the small experimental nursery on the Pike Bay Experimental Forest. Two different methods of sowing and two different coverings were used. Half of each bed of black and white spruce was drill sown, and half was sown broadcast. Then half of each of these areas was covered with peat and the remaining half with sand. The number of seedlings per square foot was determined at the end of August. The results are shown in the following table.

	Number of Seedlings per Sq. Ft.	
Method of Sowing	Black Spruce	White Spruce
Broadcast-covered with peat	75.7	83.4
Broadcast-covered with sand	56.2	89.7
Drilled-covered with peat	38.6	19.5
Drilled-covered with sand	6.9	26.0

Broadcast sowing is undoubtedly superior to drill sowing for both species, and the peat covering is probably better than sand for black spruce. The black spruce in the peat covered areas germinated considerably sooner than that in the sand also, and as a result the seedlings in these areas are larger and more vigorous.

SAMPLE PLOT TECHNIQUE

A very useful bulletin describing the details of sample plot establishment has been prepared by the Division of Silvics of the Branch of Research. This bulletin entitled "Sample Plots in Silvicultural Research" is Circular No. 333 of the U. S.

Department of Agriculture. The bulletin contains much useful information on the selection of areas for permanent and temporary plots; a discussion of the requisite degree of comparability of a set of plots is also given. The tools and technique used in laying out and measuring the sample plots are described and illustrated. Hard and fast rules cannot be laid down for sample plot work because conditions vary so widely throughout the country and plots are designed to answer such a great variety of questions. However, the general principles which must be followed are expressed simply and concretely.

The importance of the analysis of the data is stressed throughout the entire bulletin, and the use of proper statistical methods is strongly advocated. It is advised that a plan for the analysis of data should be worked out in detail before any information is collected as this will insure that all data will be in the most useful form.

A very complete bibliography is given in order that many details not presented because of their more or less limited application can be found by looking up the references.

EFFECT OF COVER ON RUN-OFF

Records of the run-off and soil loss have been kept on three watersheds near LaCrosse, Wisconsin. Each of these watersheds represents a different cover condition, and the purpose of the work is to determine how cover conditions can alter the run-off and soil loss. The watersheds were carefully selected in order that all conditions except cover might be as nearly equal as possible. Watershed G has been cleared of trees and moderate grazing is permitted. Watershed A has been left tree covered but a degree of grazing comparable with that on watershed G is permitted. Watershed B is tree covered but not grazed.

The chart on the opposite page shows the differences in run-off and soil loss during each of a number of severe storms. The "run-off factor" may require a word of explanation: it is equivalent to the amount of run-off divided by the amount of precipitation.

EFFECT OF TYPE OF COVER AND CHARACTER OF LAND-USE UPON RUN-OFF AND SOIL LOSS FROM STEEP SLOPES

UPPER MISSISSIPPI VALLEY EROSION EXPERIMENT STATION
LA CROSSE - WIS.

DATE AND CHARACTER OF STORM	WATERSHED "G"	WATERSHED "A"	WATERSHED "B"
			
JUNE 23-1934 TOTAL PRECIPITATION = .96 IN. PRECIP. PER ACRE = 3484.80 CU. FT. HIGHEST 10 MIN. INTENSITY PER HOUR = 2.04 IN.	6.3 o/o RUN-OFF FACTOR. 219.6 CU. FT. RUN-OFF PER ACRE. 59.4 LBS. SOIL LOSS PER ACRE.	NO RUN-OFF	NO RUN-OFF
JUNE 25-26 - 1934 TOTAL PRECIPITATION = 1.12 IN PRECIP. PER ACRE = 4065.60 CU. FT. HIGHEST 10 MIN. INTENSITY PER HOUR = 1.86 IN	17.6 o/o 715.1 CU. FT. 429.8 LBS.	NO RUN-OFF	NO RUN-OFF
SEPT. 2-3-4 - 1934 TOTAL PRECIPITATION = 3.76 IN. PRECIP. PER ACRE = 13648.80 CU. FT. HIGHEST 10 MIN. INTENSITY PER HOUR = 2.58 IN.	3.2 o/o 431.6 CU. FT. 56.8 LBS.	.4 o/o 57.6 CU. FT. 7.6 LBS.	.1 o/o 15.3 CU. FT. 2.1 LBS.
SEPT. 23 - 1934 TOTAL PRECIPITATION = 6.8 IN. PRECIP. PER ACRE = 2468.40 CU. FT. HIGHEST 10 MIN. INTENSITY PER HOUR = .90 IN.	.8 o/o 18.9 CU. FT. .6 LBS.	NO RUN-OFF	NO RUN-OFF
SEPT. 25-26 - 1934 TOTAL PRECIPITATION = 2.55 IN. PRECIP. PER ACRE = 9256.50 CU. FT. HIGHEST 10 MIN. INTENSITY PER HOUR = 1.80 IN.	2.3 o/o 213.4 CU. FT. 4.6 LBS.	2.6 o/o 242.9 CU. FT. .7 LBS.	.05 o/o 4.7 CU. FT. .1 LB.
OCT. 19-20 - 1934 TOTAL PRECIPITATION = 1.74 IN. PRECIP. PER ACRE = 6316.20 CU. FT. HIGHEST 10 MIN. INTENSITY PER HOUR = 2.10 IN.	3.0 o/o 191.3 CU. FT. 11.2 LBS.	2.4 o/o 151.0 CU. FT. 6.5 LBS.	NO RUN-OFF
OCT. 23-24 - 1934 TOTAL PRECIPITATION = 1.07 IN. PRECIP. PER ACRE = 3884.10 CU. FT. HIGHEST 10 MIN. INTENSITY PER HOUR = 1.08 IN	4.4 o/o 172.8 CU. FT. 12.2 LBS.	2.2 o/o 86.4 CU. FT. 2.3 LBS.	NO RUN-OFF
MAY 26-27 - 1935 TOTAL PRECIPITATION = 1.79 IN. PRECIP. PER ACRE = 6497.70 CU. FT. HIGHEST 10 MIN. INTENSITY PER HOUR = 2.28 IN.	.08 o/o 5.1 CU. FT. 1.0 LB.	NO RUN-OFF	NO RUN-OFF
JULY 5 - 1935 TOTAL PRECIPITATION = 1.85 IN. PRECIP. PER ACRE = 6715.50 CU. FT. HIGHEST 10 MIN. INTENSITY PER HOUR = 2.82 IN.	2.8 o/o 188.9 CU. FT. 160.1 LBS.	6.1 o/o 412.0 CU. FT. 364.0 LBS.	NO RUN-OFF

LEGEND

WATERSHED "G" - 5.85 ACRES DIVESTED OF ITS 2ND. GROWTH TIMBER IN 1932. SLOPE 25 TO 35 o/o. GRAZED TO OPTIMUM CARRYING CAPACITY.

WATERSHED "A" - 2.67 ACRES WITH 2ND. GROWTH HARDWOODS. SLOPE 15 TO 28 o/o. GRAZED TO OPTIMUM CARRYING CAPACITY.

WATERSHED "B" - 11.50 ACRES COVERED WITH 2ND GROWTH HARDWOOD TIMBER. SLOPE 25 TO 50 o/o. MAINTAINED IN AN UNGRAZED UNBURNED CONDITION. THIS AREA IS DEVOTED TO GOOD FOREST MANAGEMENT.

TOP BAR OF EACH STORM INDICATES % PER CENT OF RUN-OFF.
CENTER BAR OF EACH STORM INDICATES RUN-OFF IN CU. FT. PER ACRE.
BOTTOM BAR OF EACH STORM INDICATES SOIL LOSS IN LBS. PER ACRE.

GAME FOOD PLANTING

by C. M. Aldous

WILD RICE

In October 1934, approximately 10 pounds (wet) of wild rice (*Zizania Sp.*) was sown in the water of a small lake within the bounds of the Pike Bay Experimental Forest. Advantage was taken of a stiff breeze which was blowing from the northwest, and the rice was thrown over the water from the west side and the north end of the lake. Some ducks were on the lake at the time of sowing. The majority of the rice sank in about one foot of water (low level). An exceptional amount of water came into the lake this spring as the result of the heavy rains during the spring and early summer. When this lake was examined in September of this year, it was indeed gratifying to see the dense, rank growth of rice at each place where it was sown and at scattered intervals on the east side where some of the seed had floated and eventually sunk to the mud bottom. The plants were well headed out with grain which was ripening. This lake covers about 2 to 3 acres, has no outlet and is fed only by drainage from melting snows and summer rains. This experiment clearly demonstrates the possibilities of improving many of the small lakes and pot holes otherwise barren of aquatic vegetation and making them suitable for waterfowl to rest and feed in during their migration to the southland.

CLOVER PATCHES

It is believed that clover plants present one of the most universally used wildlife foods that can be grown on forest lands. An experimental demonstration was begun this year on the Pike Bay Experimental Forest to determine the degree of adaptability of three species of common clover (white sweet, medium red, and Dutch white) and, if possible, to study the reaction of the various wildlife species to each kind of clover.

Late in the fall of 1934, 81 alternate spots 7 feet by 20 feet were spaded up, paralleling each side of the road which runs east from the small lake on the experimental forest. On May 1st of this year these plots were seeded with three pounds of each kind of clover seed, alternating the species, and allowing about 1¾ ounces of seed for each spot.

The plots were visited on September 6th to determine the result of the first season's growth of each of the three species planted. Although the white sweet clover showed slightly less growth and vigor than the other two species, growth and survival was considered very satisfactory. The Dutch white and the medium red clover both made a splendid catch and produced a very dense ground cover. In all, the success of the experiment to date is very gratifying. It will be interesting to follow up and see what animals use these spots just as soon as the early frosts kill the other ground cover of the forest surrounding them.

A check-up will be made next spring to determine the effect of winter killing on each species of clover.

In addition to providing early and late food for much of the forest wildlife, clover patches present possibilities of decreasing fire hazard along roads.

FOREST TAXATION

Excessive taxation is one of the obstacles usually considered to stand in the way of private forest practice, and a solution of this problem is of prime importance to forestry as a whole. The Forest Taxation Inquiry has studied the whole problem exhaustively and reported its findings in great detail and also in the form of a brief summary entitled, "The Forest-Tax Problem and Its Solution Summarized."*

The Taxation Inquiry found that the tax obstacle arises from three main causes: (1) high cost of local government; (2) faulty administration of the property tax; (3) inherent disadvantages of the property tax when applied to deferred-yield forests. A simple and easy solution of the forest tax problem is not possible. The yield tax, often advocated by foresters as a solution to the whole perplexing problem, is shown to possess certain disadvantages which eliminate it from consideration. In the first place, the yield tax is not a just form of taxation, and would probably not be accepted by the general public if applied on a large scale. Secondly, the yield tax does not meet the financial needs of local governments.

The solution must meet all three causes of difficulty.

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* U.S.D.A. Circular No. 358, May 1935 - "The Forest-Tax Problem and Its Solution Summarized", by R. Clifford Hall.

The Taxation Inquiry was particularly concerned with overcoming the third cause; it proposes three methods of modifying the property tax as applied to forests to permit adjustment of the tax burden to deferment of income. No attempt will be made to explain the details of these three methods as they are quite complicated. Any one of the three will produce real and substantial benefits to forestry, but the enactment of a special law cannot be expected to remove the entire taxation obstacle from the path of private forestry endeavor. Plans for increase in governmental efficiency with resultant decrease in tax burdens must also be supported and put into effect.

Although taxation is not the only factor preventing the widespread adoption of good forestry practice among private timberland owners, tax reform will be of great assistance in the movement.

PARADISE *

Thanks to regular sales
Of spruce and fir
From public woods,
The residents of twenty-four
French communes
In the Jura Mountains
Not only have
No taxes to pay

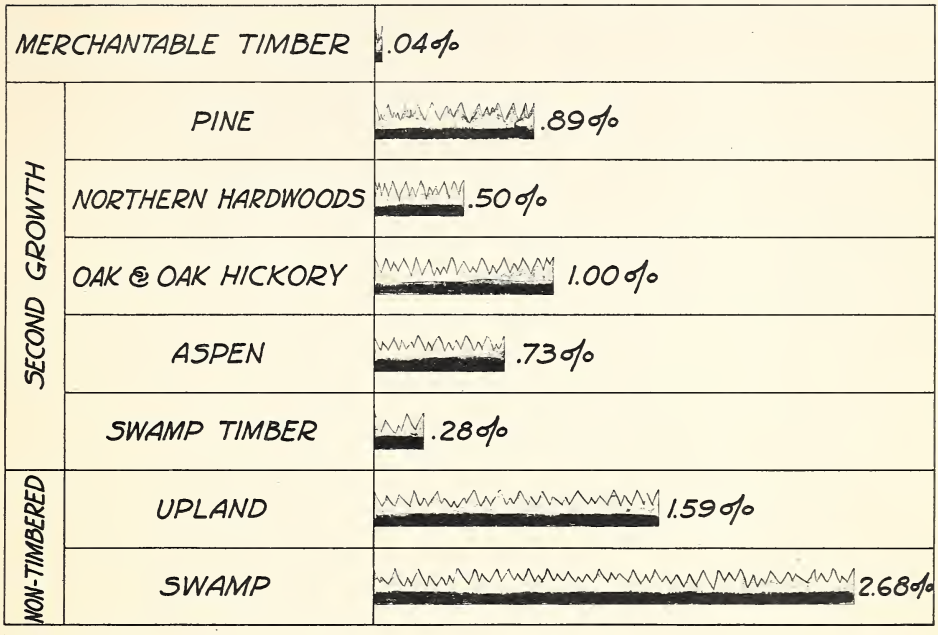
But surplus funds
Enable the authorities
To make a grant
To every citizen
Of from one to two hundred
Francs per annum.

- W. E. Farbstein

* *The New Yorker, August 24, 1935.*

RELATIVE FIRE HAZARD OF DIFFERENT COVER TYPES

MICHIGAN



FOREST FIRE HAZARD

The risk of forest fires is not equal in all forest types, and a knowledge of which types are most susceptible to fires is of considerable value in planning protection activities. An analysis of Michigan forest fire reports for the years 1928 to 1932 inclusive has been made by J. A. Mitchell of the Experiment Station. The above chart presents the results of the study.

FOREST SURVEY REPORT

A report on the "Forest Situation in the Cloquet - Superior District", the second of a series of Forest Survey reports, has just been released by the Lake States Forest Experiment Station. The district covered includes the Superior National Forest as well as State and private lands surrounding Duluth and Cloquet.

One purpose of the survey has been to determine the possibilities of sustained yield forest management for the existing forest industries in this territory.

The outstanding conclusion from the study is that the district contains enough productive forest land to more than care for existing industries, but that sustained production cannot be assured without some radical adjustments in ownership and methods of forest management. Some improvement in growing stock and some adjustments in industrial production must be made because much of the present growth is in types and species not favored in commercial operations. The present rate of cutting in the white and Norway pine types should be curtailed, but the rate of cutting in the jack pine and aspen types can be considerably increased without impairing the productiveness of the forest.

The southern part of the district around Duluth and Cloquet contains the greater part of the forest industries, but the forest lands -- tax delinquent areas and farm woodlots -- are badly run down. The central division including the Iron Range and lower North Shore which naturally should supply much of the spruce, balsam and pine to the industries, is being neglected and is in danger of joining the southern part as an area of devastated land.

The promising features of the situation are the excellent forest conditions which exist in the Northern division which contains the old Superior National Forest, and the fact that public forests are now being extended into the territory nearer Cloquet.

The report recommends early public acquisition of additional key forest tracts in the areas adjacent to the industries. It suggests concentration of intensive forest work upon nearby tracts essential to the sustained yield plan. It proposes public aid to farmers and other private owners to stimulate better forest management in productive lands surrounding Cloquet

and Duluth.

In the meantime, the reservoir of pine, spruce and balsam on the Superior National Forest can help to tide the industries over until the new forests are developed.

A few extra copies of this report are available to anyone especially interested in this type of study.

VOLUME OF TOPS AND LIMBS

For every thousand feet of sawlogs cut, a volume of wood equal to almost half of the used volume is left in the woods, except where tops and limbs are utilized for pulpwood or chemical wood. In some hardwoods the waste may be as high as two cords per thousand board feet of sawlog material.

The Forest Survey has compiled figures on the volume of tops and limbs per thousand board feet (Scribner) of sawlog material. It should be recognized that although these values are averages obtained from an analysis of considerable data, they cannot be expected to apply with great accuracy to small volumes of sawlog material. The volume of tops and limbs is an extremely variable quantity, and it is not practical to attempt to estimate it on an individual tree basis; therefore, the table gives the average volume of tops and limbs which arises from the production of a thousand board feet of sawlogs.

Species	Cu.Ft. Volume of Tops and Limbs* per M Feet (Scribner) of Sawlogs.
White pine	30.4
Norway pine	22.3
Jack pine	80.8
Mixed hardwoods	121.9
Scrub oak	139.2
Balsam fir	77.6
Black spruce	96.1
Ash-elm	132.8
Aspen	84.8
Average for all species	88.7

* Excludes all material less than 4 inches in diameter and all limbs in conifers.

In the case of spruce, fir, and jack pine, a large part of the material unsuitable for sawlogs can be used for pulpwood. A smaller part of aspen top-wood is also useful for pulpwood. Close utilization of white and Norway pine and lack of large branches accounts for the small amount of waste material in these two species.

WATER RELATION OF PLANTS IN SEMI-ARID SOILS

An interesting series of physiological experiments performed by J. F. Breazeale and F. J. Crider* of the University of Arizona show that plants have unexpected abilities for protecting themselves against the reduction of soil moisture below the wilting point.

Field observations supported by a number of laboratory experiments have convinced these two scientists that plants are able to absorb water through a portion of the root system located in moist soil, then transport and exude it through a portion of the roots growing in a very dry soil. In this manner a thin film of soil in contact with the roots is kept above the wilting point. In some cases sufficient moisture is given off into the dry soil to permit other plants to grow and survive, although they would not be able to do so without the aid of the plant exuding moisture.

The authors offer this as a possible explanation of the presence of large numbers of small Douglas fir saplings beneath the canopy of a large western yellow pine. The pine apparently acts as a "nurse", and it may well be that its beneficial action consists in tapping moist soil layers at considerable depth and exuding this moisture in the shallower layers where it becomes available for the young Douglas fir saplings. This phenomenon is probably not of great importance in the humid Lake States Region, but it should have application in parts of the Great Plains Shelterbelt Zone.

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* "Plant Association and Survival, and the Build-up of Moisture in Semi-Arid Soils", by J. F. Breazeale and F. J. Crider, published by the University of Arizona, Tuscon, Arizona.